Circadian Rhythm

Introduction

A Circadian rhythm is any biological process that displays an endogenous,entrainable oscillation of about 24 hours.These 24-hour rhythms are driven by a circadian clock,and they have been widely observed in plants,animals,funcgi and cyanobacteria.

The term circadian comes from the Latin circa meaning "around" (or "approximately"),and diem,meaning "day".Although circadian rhythms are endogenous("built-in"),they are adjusted to the local environment by external clues called zeitgebers(from German "time giver"),which include light,temperature and redox cycles.

Aims and Objectives

- To find whether there is significant difference between the three age groups-teenagers,working people and senior citizens,using ANOVA.
- To find the coefficient of association between the mobile usage and freshness in the morning.
- To find correlation between sleep and exercise among the different groups and to draw scatter plot.
- To find the existence of association between phone usage and freshness by Yule's Coefficinet of association and Chi-Square test.
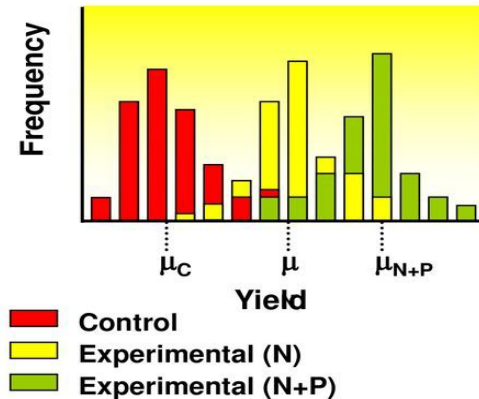
Questionaire

1. At what time you go to bed?
2. Usually,how long does it take for you to fall asleep?
3. Do you take your mobile to bed?
4. How often you use mobile before you sleep?
5. On average,how many hours you get sleep at night?
6. How fresh you are on waking up in the morning?
7. How long do you exercise daily?
8. If not daily,how many hours in a week do you exercise?
9. Do you sleep in the afternoon?
10. Are you aware that abody have an internal clock?

What is ANOVA?
ANOVA(Analysis of Variance) is used to test the significant difference for more then two sample means/population means.If your independent variable is categorical and dependent variable is continuous we use ANOVA.

When to use ANOVA

- Tests for effect of "discrete" independent variables.
- Each independent variable is called a *factor*, and each factor may have two or more *levels* or treatments (e.g. crop yields with nitrogen (N) or nitrogen and phosphorous (N + P) added).
- ANOVA tests *whether all group means are the same*.
- Use when number of levels (groups) *is greater than two*.

Control
Experimental (N)
Experimental (N+P)

The Methods and techniques exhibited for the collection of the data is questionnaire method and google form technique.

Data was collected for college going students,working people and senior citizens based on their number of sleeping hours(in minutes).

> **ANOVA (ONE WAY CLASSIFICATION).**

The Linear Mathematical model for One Way ANOVA is

$$Y_{ij} = \mu + \alpha i + e_{ij}$$

Where,

Y_{ij} »Effect on sleep of the jth individual due to the ith age group.

μ »General Mean Effect.

α_i»Effect on sleep due to the ith age group.

e_{ij} » Random errors or Chance errors.

The Null Hypothesis for Our Model is –

- **HO** » There is no significant difference between the three age groups, that is $\mu_A = \mu_B = \mu_C = \mu$ / $\alpha_A = \alpha_B = \alpha_C = 0$; i =A, B, C.

- **H1** » There is a significant difference between the age groups, that is at least one $\alpha_i \neq 0$ where i=A, B, C.

TEENAGER	WORKING PEOPLE	SENIOR CITIZEN
Average number of hours of sleep at night(in mins)	Average number of hours of sleep at night(in mins)	Average number of hours of sleep at night(in mins)
390	360	300
360	420	420
330	390	480
360	420	420
360	420	420
360	360	420
390	540	420
330	390	300
390	360	390
360	300	360
360	240	360
420	360	360
390	420	420

420	480	420
360	360	360
540	420	420
480	480	360
360	420	240
300	360	360
240	420	300
300	360	420
480	420	480
360	300	480
330	360	360
360	360	480
390	360	300
360	360	420
300	420	480
420	360	480
360	480	360
360	480	420
420	420	540
420	540	360
360	480	420
420	420	300
300	360	480
360	420	360
300	300	480
360	420	480
420	420	360
420	480	300
360	420	480
390	480	420
420	300	480
360	480	540
480	420	480
360	420	360
300	240	360

CALCULATIONS

Groups	Count	Sum	Average	Variance
Teenager	47	17580	374.0425532	3085.476411
Working people	47	18840	400.8510638	4516.651249
Senior citizen	47	19110	406.5957447	4688.159112

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	28378.7234	2	14189.3617	3.463555074	0.03406688	3.0617157
Within Groups	565353.1915	138	4096.762257			
Total	593731.9149	140				

ANOVA

Here $F_{cal} > F_{tab}$;

i.e. $3.463555 > 3.06171$

So here we reject Ho i.e. there is significant difference between the age groups.

➢ CRITICAL DIFFERENCE

- $Y_1. = 17580$ (TEENAGER) $\bar{y}_1. = 374.0425532$
- $Y_2. = 18840$ (WORKING) $\bar{y}_2. = 400.8510638$
- $Y_3. = 19110$ (SENIOUR) $\bar{y}_3. = 406.5957447$

$C.D. = 25.878$

$|\bar{y}_1. - \bar{y}_2.| = 26.8085 > C.D.$

$|\bar{y}_1. - \bar{y}_3.| = 32.5532 > C.D.$
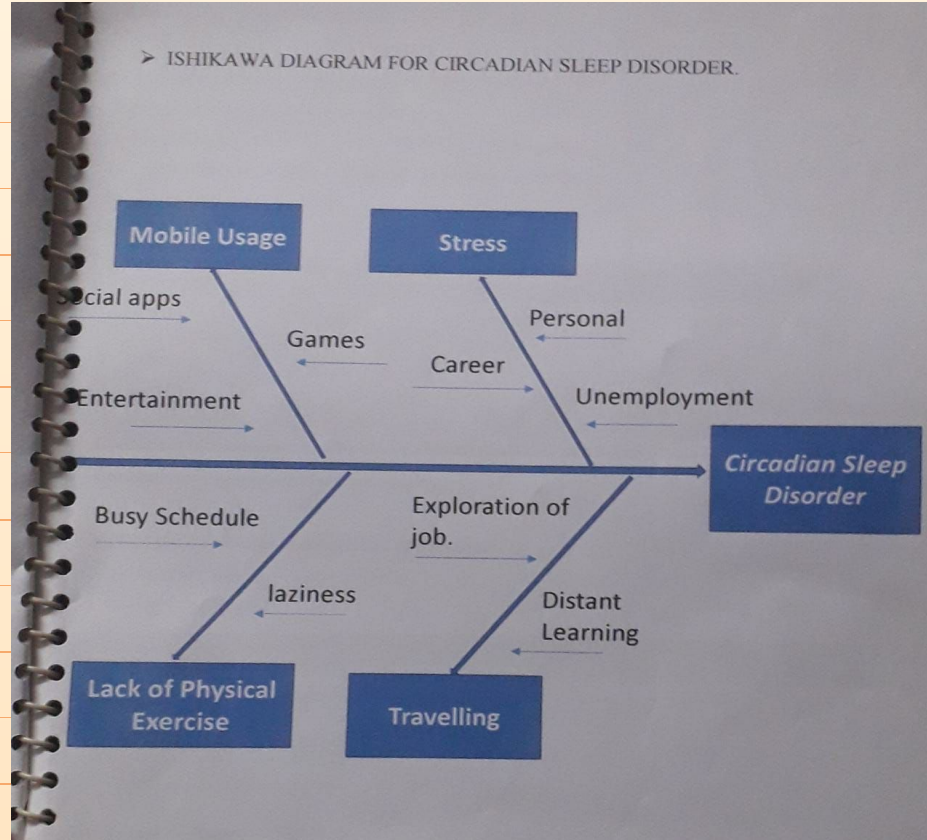
$|\bar{y}_2. - \bar{y}_3.| = 5.74468 < C.D.$

Hence, there is significant difference between —

1.) $\bar{y}_1.$ and $\bar{y}_2.$ Here teenagers and working people differ significantly.
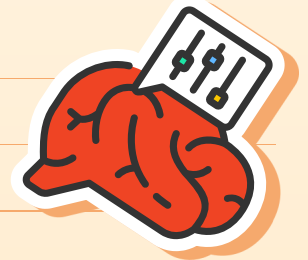
➤ ISHIKAWA DIAGRAM FOR CIRCADIAN SLEEP DISORDER.

➤ COEFFICIENT OF ASSOCIATION

A Coefficient of Association measures the strength of a relationship. "Association" means that the underlined variables have shared or common elements or some degree of agreement. A large number of different association coefficients is available. Which you choose is dependent on many factors, including the data type That said, a coefficient of association is independent of its measurement scale. These coefficients typically range between 0 and 1, where 0 is no relationship and 1 is a perfect relationship. However, some measures of association range from -1 to 1, where -1 indicates a perfect inverse relationship.

To find the Coefficient of Association of Working People.

The two attributes which are considered are: -

A: Mobile usage at the night.   α:No Mobile usage at the night

B: Freshness in the Morning.   ß: No freshness in the Morning.

(A)=38 (B)=34 (α)=10   (ß)=14

(Aß)=28 N=48

	B	ß	TOTAL
A	(AB)=28	(Aß)=10	(A)=38
α	(αB)=6	(αß)=4	(α)=10
TOTAL	(B)=34	(ß)=14	N=48

Coefficient of association = (AB)(αß) - (Aß)(αB) / (AB)(αß) +(Aß) (αB) = .3023

Conclusion: -There is positively association.
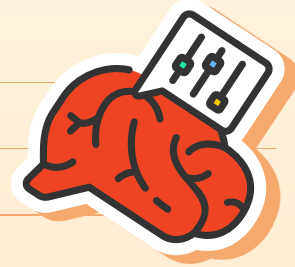
To find the Coefficient of Association of Teenagers.

- (A)=47 (α)=1
- (B)=32 (ß)=16

	B	ß	TOTAL
A	(AB)=31	(Aß)=16	(A)=47
α	(αB)=1	(αß)=0	(α)=1
TOTAL	(B)=32	(ß)=16	N=48

Coefficient of Association(Q)=1

Conclusion: -The Association is Perfect and Positive.

To find the Coefficient of Association of Senior Citizens.

(A)= 23   (B)=38

(α)=25   (ß)=10

|	B	ß	TOTAL
A	(AB)=17	(Aß)=6	(A)=23
α	(αB)=21	(αß)=4	(α)=25
TOTAL	(B)=38	(ß)=10	N=48

Coefficient of Association(Q)=-0.298

Conclusion: -The Association is Negatively Associated.

➢ **SCATTER PLOT**

        A scatter plot can be used either when one continuous variable that is under the control of the experimenter and the other depends on it or when both continuous variables are independent.
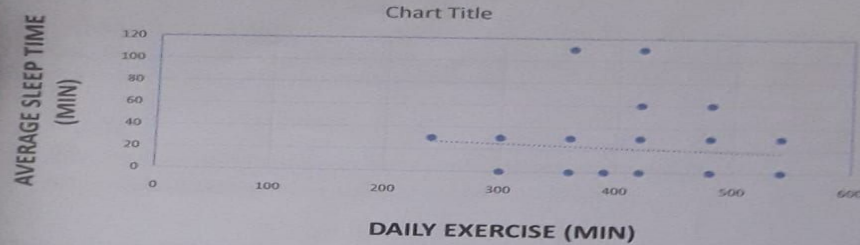
- To find correlation between sleep and the exercise within the groups.

FOR SENIOR CITIZEN: -
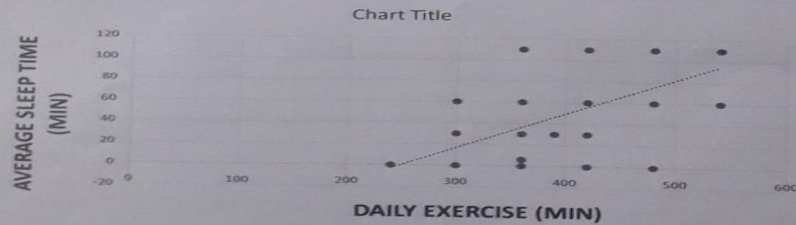
Now, r = 0.629654. Therefore, the variables are positively correlated with each other. There is relation between sleep and exercise.
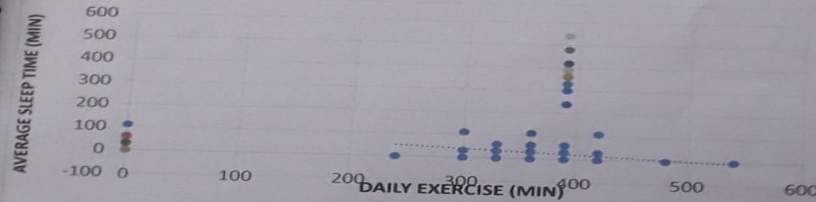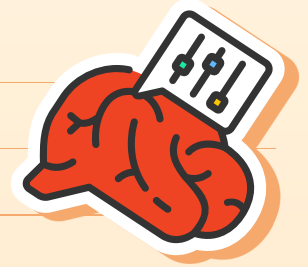
FOR WORKING PEOPLE: -

Here r = -0.07182

Variables are negatively correlated. There is no relation between sleep and exercise.

FOR TEENAGER: -

Here r = -0.26479

that means it is negatively correlated. There is no relation between sleep and exercise.

➢ CHISQUARE TEST

The test is based on comparing the frequencies actually observed in the categories cells with the frequencies expected under some hypothesis using test statistic.

HYPOTHESIS:

- H0: No association between the phone usage and freshness in morning.
- H1: Association between the phone usage and freshness in morning.

Tabulated data for teenager:

actual value	yes	no	grand total
fresh	10	27	37
tired	6	5	11
total	16	32	48

Expected value	yes	no	grand total
fresh	12.33333	24.66667	37
tired	3.666667	7.333333	11
total	16	32	48

P = 0.089162

Here p > .05

Therefore, we will not reject HO

I.E there is no association between the attributes.

Actual value	yes	No	grand total
fresh	18	16	34
tired	9	5	14
total	27	21	48

Expected value	yes	No	grand total
fresh	19.125	14.875	34
tired	7.875	6.125	14
total	27	21	48

$P = 0.471436$

Here $p > .05$

Therefore, we will not reject HO

I.E there is no association between the attributes.

Tabulated data for senior citizen:

actual	yes	No	grand total
fresh	14	17	31
tired	9	8	17
total	23	15	48

expected	yes	No	grand total
fresh	14.85417	9.6875	31
tired	8.145833	5.3125	17
total	23	15	48

$P = 0.008069$

Here $p < .05$

Therefore, we will reject HO

I.E there is association between the attributes.
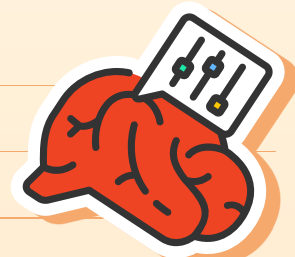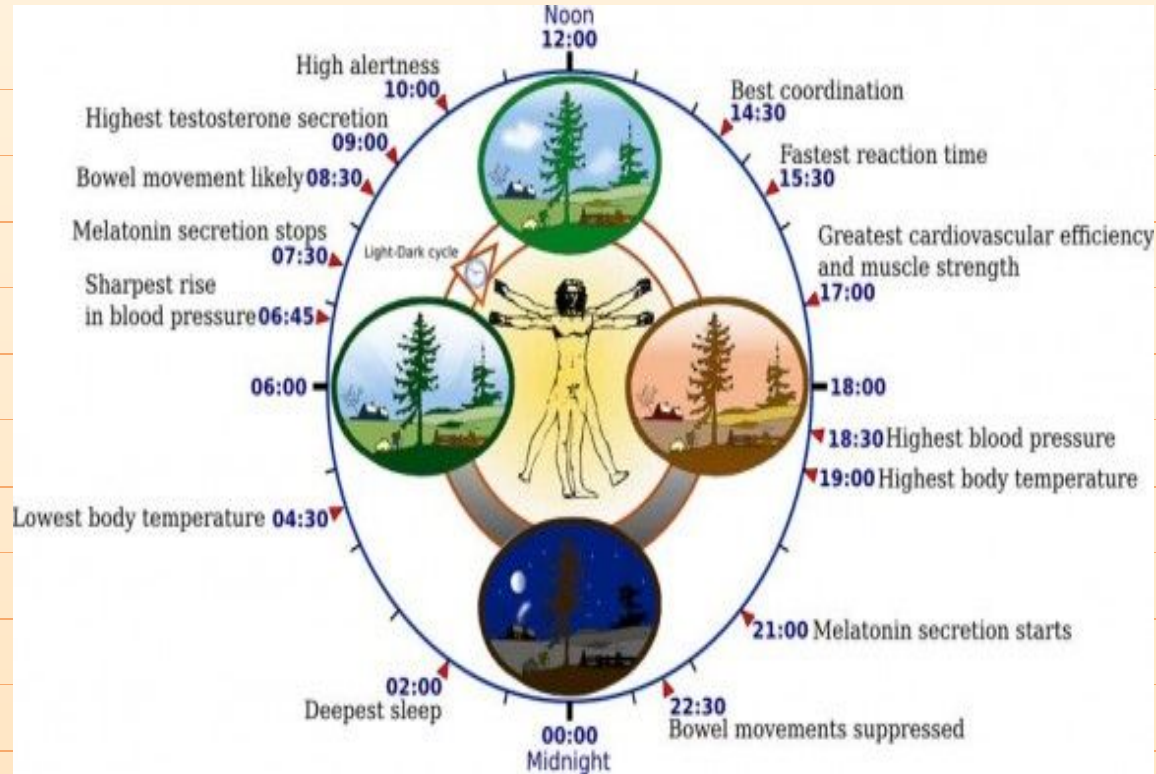
CONCLUSIONS AND SUMMARY

1. TEENAGERS: -

- ❑ ANOVA Teenagers differ Significantly with Working People and Senior citizens.
- ❑ Coefficient of Association: - The coefficient of Association is Perfect and Positive between mobile usage in the night and freshness in the Morning.
- ❑ Scatter Plot: - No Relation between exercise and hours of sleep.
- ❑ CHITEST: - There is no association between the 2 attributes (i.e. phone usage and freshness in the morning)

2. WORKING PEOPLE

- ❑ ANOVA: - There is no significant difference between the working people and senior citizen, and there is significant difference between working people and teenagers.
- ❑ COEFFICIENT OF ASSOCIATION: - The coefficient of Association is Perfect and Positive between mobile usage in the night and freshness in the Morning.
- ❑ Scatter Plot: - No Relation between exercise and hours of sleep.
- ❑ CHITEST: -There is no association between the 2 attributes (i.e. phone usage and freshness in the morning)

3. SENIOR CITIZEN: -

- ❑ ANOVA: - There is no significant difference between working people and senior citizen and significant difference between teenager and senior citizen
- ❑ COEFFICIENT OF ASSOCIATION: -The coefficient of Association is negative relation between mobile usage in the night and freshness in the Morning.
- ❑ Scatter Plot: -There is Relation between exercise and hours of sleep.
- ❑ CHITEST: -There is association between the 2 attributes (i.e. phone usage and freshness in the morning)

THANK YOU